Computer Self-Efficacy Among Senior High School Teachers in Ghana and the Functionality of Demographic Variables on their Computer Self-efficacy

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ABSTRACT
The study is aimed at investigating 1) the level of computer self-efficacy among public senior high school (SHS) teachers in Ghana and 2) the functionality of teachers' age, gender, and computer experiences on their computer self-efficacy. Four hundred and Seven (407) SHS teachers were used for the study. The "Computer Self-Efficacy" (CSE) scale, developed by Teo and Koh (2010) was adapted and used for data collection. Descriptive statistics, *t* tests and univariate analyses were employed to analyse the data. The results showed that generally, SHS teachers neither disagree nor agree that they are computer self-efficacious; specifically they agree that they are self-efficacious in basic computer skills but not certain about their self-efficacy in web based skills and not self-efficacious in media related computer skills. Moreover, the results revealed that teachers' age, gender, and computer experiences have similar and dissimilar influences on their computer self-efficacy related to different computer application software. Furthermore, according to the results, teachers' gender and their computer experience have interaction effect on their computer self-efficacy whilst 1) teachers' gender and age and 2) teachers' age and computer experience have no statistically significant interaction effect on their computer self-efficacy. The study provides new and vital information for educational practitioners in Ghana. The findings suggest that xpecting teachers in developing country such as Ghana to teach with technology still remains as a very challenging issue which requires important attention. In addition, the study provides new insights into explanation for contradictory research findings of the effect of (SHS) teachers' age, gender, and computer experience on their computer self-efficacy in the literature.

Keywords: Computer self-efficacy; public senior high school teachers; age; gender; computer experience; demographic variables; interaction effect

INTRODUCTION
Increasingly, computer technology has been and is becoming more powerful tool in all over the world for changing the strategies of teaching and learning in classrooms since its introduction in education in the 1960s and 70s.This has been necessitated by the conceptions of techno-reformers (e.g. Papert, 1980) that computer technology can revolutionalise the educational landscape. Nowadays, computer technology (e.g., the Internet, iPad, MOOCS, 3Ds, blackboard, MOODLE, etc) has become a common tool in many schools and institutions in both developing and developed countries; and are being used to teach all subject areas (Khorrami-Arani, 2001) in different modes including distance teaching and regular teaching. The intention is that computer technology can enhance classroom teaching for development of 21st century competencies.

Almost all the recognised organisations and institutions such as the United Nations (UN), United Nations Educational, Scientific and Cultural Organisation (UNESCO), World Bank, African Development Bank (AfDB), Organisation for Economic Cooperation and Development (OECD) have recognised, and agreed to the assertion that ICT can bring tremendous change in education. For example, United Nations Report (2005) shows the potential of computer technology to expand access to quality education and to improve literacy in developing countries. In this regard, these organisations have been sponsoring, in diverse ways, various projects worldwide aimed at integrating computer into education to promote the development of 21st century competencies. Similarly, as indicated by Buabeng-Andoh (2012), many governments in both developed and developing countries have initiated serious investments in computer technology to improve teaching and learning.

In Ghana, the integration of computer into education began to receive government attention 14 years ago. Many of the stakeholders in Ghana including governments and educational practitioners have the strong belief that introducing computer in education would solve almost all the educational problems in Ghana (Republic of Ghana, 2002; World Bank, 2007). In 2004, the Parliament of Ghana passed into law Ghana's ICT (Information and Communication Technology) for Accelerated Development (ICT4AD) Policy. Among other things the policy requires the use of ICT or computer for teaching and learning at all levels of education. As a result of this policy, ICT courses were introduced in all basic and secondary schools or SHSs in Ghana in 2007. All tertiary institutions in Ghana offer computer technology as a compulsory course. Computer laboratories have been built in almost all the basic and secondary schools (Mereku, Yidana, Hordzi, Tete-Mensah, & Williams, 2009) and teachers have been participated in ICT training workshops to facilitate the successful integration of computer into teaching and learning. However, evidence in the literature (e.g., Gulbahar, 2007; Salomon, 2002; Sarfo & Elen, 2008; Sarfo & Ansong-Gyimah, 2011; Inan & Lowther, 2009) on integration of computer into education show that in spite of the huge investments, ICT implementation in the school systems of many developed and developing countries has not been effective or successful as expected. A study by Mereku et al. (2009) on pedagogical integration of ICT in various basic and secondary schools in Ghana indicates that there is a gap between the policy directives and actual practice.

Successful integration of computer into education in both advanced and developing countries is a highly complex goal for technology reformers and instructional technologists to achieve (Mills & Tincher, 2003). A number of research studies (e.g., Bingimlas, 2009; Ertmer, 2006; Bitner & Bitner, 2002) in the literature identify a long list of factors that potentially encourage or handicap the successful integration of computers in teaching and learning. Some of the factors identified are school related which include poor planning for the use of technology, access to computers and many others. Bitner and Bitner (2002) pointed out that school related factors nonetheless are not the key determinants to the success or failure of computer use in teaching and learning; effective use of computer in the classroom usually lies with the teachers. Wadmany (2011) and other researchers support the assertion that teacher related factors have the most impact on the integration of computer into education. It is the teachers' skills, and self-efficacy beliefs, among others, that determine the choices they make about what, when, where and how to use, and integrate computers into teaching (Bitner & Bitner, 2002). Specifically, teachers' computer self-efficacy or teacher confidence has been hypothesised as having an influence on computer use for classroom teaching (Ertmer, 2006; Aremu & Fasan, 2012). This notwithstanding, there is inconsistent research findings (e.g., Jegede, 2007; Adebowale, Adediwura & Bada, 2009; Aremu &Fusan, 2012; Ebitar, 2015) on the influence of senior secondary school teachers demographic variables on their computer self-efficacy. In the literature, little is known about the interaction effect of teachers' demographic variables on their computer self-efficacy. This makes it problematic for designing and implementation of effective interventions to enhance teacher's confidence and usage of computer in teaching and learning. To contribute to the solution of this problem in both developed and developing countries, the study is designed to examine the functionality and interaction effect of teacher-related-variables such as gender, age, and computer experience on their computer self-efficacy. In addition, Ghana, as a developing country, began the introduction of computer in education not very long ago. Unlike other developed countries, in Ghana few studies (e.g., Sarfo. 2011, Buabeng-Andoh, 2012; Mereku et al., 2009; Sarfo, Amankwah, Oti-Agyen & Yidana, 2016) which have been conducted into integration of computer in education concentrate on computer access and use, gender and computer use, and competencies in computer usage among teachers in senior high schools (SHS) in Ghana. There is lack of empirical study conducted to examine teachers' computer self-efficacy in SHSs in Ghana. With this regard, the present research is also conducted to examine the level of computer self-efficacy among SHS teachers in Ghana. The results of the study will provide scientific knowledge and understanding about the level of computer self-efficacy among SHS (in Ghana). Again, the study will contribute to the understanding of relationships among the factors that impact teachers' computer self-efficacy globally.

Computer self-efficacy

Self-efficacy is defined by Bandura (1994) as "people's beliefs about their capabilities to create designated levels of performance that exercise influence over events that affect their levels of performance" (Bandura, 1994, p 2). Similarly, Kinzie, Delcourt and Powers (1994) defined self-efficacy as an individual's confidence in his or her ability which may impact on the performance of tasks. They further explained that "self-efficacy reflects an individual's confidence in his/her ability to perform the behaviour required to produce specific outcome and to directly impact the choice to engage in a task, as well as the effort that will be expended and the persistence that will be exhibited" (p. 747). Self-efficacy, based on the above, is described as individuals' beliefs or confidence in their capabilities of executing a task to a required level of satisfaction. Self-efficacy beliefs, according to Zimmerman (2000), differ conceptually and psychometrically from related motivational constructs, such as outcome expectation and self-concept.

Self-efficacy has been found to influence choice of whether to engage in a task, the effort expended in performing it and the persistence shown in accomplishing it (Bouffard-Bouchard, 1990). As indicated by Bandura (1994) people with a high sense of efficacy have the will power to cope with the obstacles and setbacks that characterise difficult undertaking. According to Pajares (2002), self-efficacy perception provides individuals with happiness, motivation and a sense of achievement. For Bandura (1986), the greater people perceived their self-efficacy to be, the more active and longer they persisted in their effort. Bandura (1994) proposed that people perceived self-efficacy can be developed by four main sources. These are 1) mastery experiences (combination of cognitive and behavioural tools to create successful action to promote performance), 2) vicarious experiences provided by social models, 3) social persuasion, and 4) physical and emotional states. As a result of the sources, self-efficacy beliefs are studied as indicators of change; they are susceptible to instruction or intervention (Zimmerman, 2000; Bandura, 1994). A research study by Bandura (1997) showed that self-efficacy beliefs are influenced by environmental situations, personal factors, cognitive factors, and demographic factors, such as gender and age**.** People's self-efficacy judgements are measured using questionnaire items that are task specific and vary in difficulty and degree of confidence (Zimmerman, 2000). Self-efficacy questionnaire measures individuals' performance capabilities rather than personal qualities.

Specifically, computer self-efficacy which has been adapted from self-efficacy theory in social cognitive psychology is defined as an individual's judgement of their knowledge and capabilities to use computers in diverse situations (Compeau & Higgins, 1995). Computer self-efficacy is therefore based on beliefs and confidence about what a person can accomplish with the skills and knowledge of computer they already possess. In this study, teachers' computer self-efficacy is focused on SHS teachers beliefs and confidence in using basic computer skills, media related skills and web based skills (Teo & Koh, 2010) to facilitate teaching and learning.
It is generally conceptualised that individuals with high computer self-efficacy will be more willing and likely to learn and do new things using computers (Kinzie**.** Delcourt, & Powers, 1994). Teachers with a high sense of computer self-efficacy will be more capable of using the computer and would have the will power to endure the obstacles and setbacks involved with the use of computers in the classroom to facilitate teaching and learning. Research findings by Compeau and Higgins (1995) showed that teachers with higher computer self-efficacy tend to see themselves as able to use computer technology, however teachers with lower computer self-efficacy become more frustrated and more anxious working with computers. Similarly, according to Ozcelik & Kurt (2007), teachers who are confident in their capabilities of using computers will be more likely to utilise the tools more often in performing classroom tasks. Thus, teachers' computer self-efficacy is a strong determinant in studying teachers' behaviours with respect to the use of computers in teaching and learning (Cassidy & Eachus, 2002).

Teachers' gender and their computer self-efficacy
Similar to gender and ICT usage, the difference between gender and computer self-efficacy has been of great interest in educational technology community. Some of the studies indicated a statistically significant difference between gender and computer self-efficacy**.** For instance, Aremu and Fasan (2012) found gender to be of a significant predictor of teachers' computer self-efficacy. Moreover, Kong, Chai, Tan, Hasbee and Ting (2014) in a study of 102 Malaysian English as Second Language (ESL) teachers discovered that male teachers have a significantly higher computer self-efficacy than their female counterparts. To support this, Ozturk, Bozkurt, Kartal, Demir and Ekici (2011) adopted descriptive survey design to explore prospective science teachers' computer related self-efficacy perceptions in terms of gender. The results indicated that computer related self-efficacy perception scores of teachers differed significantly according to gender. On the contrary, Jegede (2007) found no gender influence on teachers' computer self-efficacy in a study conducted to explore factors that are associated with computer self-efficacy among teachers. Even though most of the studies reported show that males have higher computer self-efficacy than female teachers, the situation is not fully clear in the literature and more especially in the context of SHS teachers in Ghana.

Teachers' age and their computer self-efficacy
According to Bandura (1994) mastery experience is considered as one of the important sources of self-efficacy. Interestingly, with regard to technology (computer) *younger teachers* seem to have more computer experience than *older teachers*. This is because many of the old teachers had their education before the computer age and had less exposure to the computer usage compared to young teachers. The age factor in the use of computer technologies has also been explained in the context of generational differences by Prensky (2001). Prensky (2001) introduced two important concepts of the "Digital natives" and "Digital Immigrants". He therefore labelled the younger generation as the digital natives as they are all *native speakers* of the digital language of computer technologies and people who were born before this new digital era, which started around 1980 (in developed countries) as digital immigrants. He further argued that digital immigrants may learn to use computer technologies but will still be in some discomfort. The implication is that the younger generation (digital natives)

are more likely to have the skills and confidence to use computer technology than the older generation (digital immigrants). A study carried out in Egypt by Ebitar (2015) revealed that age had significant effect on teachers' computer self-efficacy. Additional research findings by Czaja et al. (2006) showed that in general computer users above the age of 65 had low self-efficacy in their ability to use computer than did younger people. However, Awofala, Fatade and Udeani (2015) conducted a study that explored Nigerian pre-service teachers' level of computer self-efficacy, and to determine the invariability of this with respect to the demographic variables such as age, gender and discipline of study. Among others, the results showed that construct of computer self-efficacy appeared invariant with respect to the age classification. In addition, Adebowale et. al (2009) also found age not to be a significant predictor of computer self-efficacy. It is argued, based on the above empirical findings, that the effect of age and computer self-efficacy remains not very clear and requires more empirical investigation in different contexts for clearer understanding and direction.

Teachers ' computer experience and their computer self-efficacy

Computer experience has been defined as the frequency of computer usage for different activities and purposes. Bandura (1994) asserted that experience is particularly influential and recognised as one of the strongest factors that contributes to people's self-efficacy because of its direct and personal nature. Compeau and Higgins (1995) claimed that prior computer experience has been shown to be a key individual difference variable that predicts computer self-efficacy in a variety of computer applications. Bozionelos (2001) research study revealed that when individuals gained more experience with computers, they were less likely to be anxious when dealing with technology. This is reinforced by research findings by Elbitar (2015) that there is statistically significant relationship between teachers' computer experience and their perceived computer self-efficacy. However, Karsten and Roth (1998) investigated the relationships among computer experience, computer self-efficacy and performance in Information Technology courses. Their study revealed that computer experience had no significant influence on computer self-efficacy beliefs.

Current study

From the literature review above, many studies related to computer self-efficacy have been conducted across the world. However, a close look at the review shows that 1) computer self- efficacy among SHS teachers has not been given prominence in the Ghanaian context; 2) there is inconsistent research findings on the influence of (SHS) teachers' age, computer experience, and gender on their computer self efficacy in both developed and developing countries; and 3) specifically the combined effect of teachers' gender, age, and computer experience on teachers' computer self-efficacy, to some enormous extent, has not been systemically investigated in both developed and developing countries. To fill the above identified research gaps in the literature, this study is designed to address the following research questions:

1. What is the level of computer self-efficacy of senior high school teachers in Ghana?
2. What is the effect of teachers' age, gender, and computer experience on their computer self-efficacy?
3. What is the interaction effects of teachers' age, gender and computer experience on their computer self-efficacy?

The findings of the present study would provide new and additional insight, from Ghanaian context, to the literature on computer self-efficacy among senior high school teachers.

METHODS

Descriptive survey design was adopted in this study since it is accurate and deemed appropriate for educational fact-finding (Cohen, Manion & Morrison, 2000).

Participants

The population of this study was all the public senior high school teachers in the Ashanti Region of Ghana. In all, 434 teachers were randomly selected for the study. Questionnaire from 407 respondents were considered valid for the analyses. The composition of the 407 participants was as follows: 229 males and 178 females; 231 were aged between 20 -30 years and 176 were aged 31 years and above; 246 had low computer experience (below five years of working or studying with a computer) and 161 had high computer experience (above five years of working or studying with a computer**)..**

Research instruments and measures

The instrument used for collecting data from the respondents' was questionnaire which was made up of two parts with the first part eliciting information about the respondents' demographic background such as age, gender, computer experience. The second part of the questionnaire was the adapted "Computer Self-Efficacy Scale" developed by Teo and Koh (2010). The Computer Self-Efficacy Scale (CSE) is a twelve-item instrument that consists of three components and was designed to measure specific self-efficacy in using computers. The first

component is the Basic Computer Skills (BCS), which is composed of five items (e.g. I am able to use word processor to create, edit and format documents for specific purposes). The Media Related Skills (MRS) component had four items (e.g. I am able to use graphic editors to create resources for teaching) and the third component of Web Based Skills (WBS) which consisted of three items (e.g. I am able to use conferencing software for collaboration purposes). All the items on the questionnaire were measured on a 5- point Likert scales ranging from (1) strongly disagree to (5) strongly agree. The total score of the twelve items provides the general level of computer self-efficacy. The questionnaire was pilot tested.

Procedure

The questionnaire was pilot tested on a group of SHS teachers (n=45) drawn from four schools outside of the study area. Few issues related to grammar and construction of the items were identified, discussed and worked on. The Cronbach alphas were: 0.742 for basic computer skills, 0.726 for media related skills and 0.756 for web based skills. The Cronbach alpha for the overall CSE was 0.848. According, Straub, Boudreau and Gefen (2004), a reliability coefficient of 0.70 or above is good enough for research purposes. After the pilot study, the questionnaires for the main study were personally administered by the researchers to the teachers in their schools. The participants were given one week to complete the questionnaires. Out of 434 questionnaires administered, 407 were finally retrieved and were found appropriate for the analyses.

Data Analysis

Descriptive statistic, independent sample *t*-test and univariate analysis were conducted to answer the formulated research questions. Since the sample of the study is approximately normal, while interpreting the mean scores for research question one, the researchers adopted the criteria suggested by Scott (1999) as cited in Rajashekhar (2015) together with the mean (M) scores in Table 2. Table 1 highlights the decision rule.

Table 1: Decision Rule

S/N	Mean Score	Interpretation
1	Up to 2.8	Disagree
2	2.9 – 3.2	Neutral or Neither Disagree nor Agree
3	Above – 3.2	Agree

RESULTS

The level of computer self-efficacy of senior high school teachers

The participants' mean scores with the standard deviations on their levels of computer self-efficacy of the three subscales are presented in Table 2.

Table 2: Level of Computer Self-Efficacy Among Teachers

S/N	Subscale/item	Mean	Standard Deviation
	Basic Computer Skills (BCS)	**3.77**	**1.134**
BCS 1	I am able to use word processor to create, edit and format documents for specific purposes.	4.21	1.002
BCS 2	I am able to use the internet to search for information and resources.	3.91	1.061
BCS 3	I am able to use email for communication	3.85	1.083
BCS 4	I am able to use presentation software for classroom delivery.	3.52	1.294
BCS 5	I am able to use spreadsheet to record data, compute simple calculations and represent data in the form of tables and graphs.	3.36	1.230
	Media Related Skills (MRS)	**2.26**	**1.186**
MRS 1	I am able to use graphic editors to create resources for teaching.	2.87	1.347
MRS 2	I am able to use video editing software.	2.33	1.119
MRS 3	I am able to use website editors to create and/or modify web pages.	2.01	1.256
MRS 4	I am able to use animation software to create animations.	1.84	1.021
	Web Based Skills (WBS)	**3.12**	**1.338**
WBS 1	I am able to use conferencing software for collaboration purposes.	3.21	1.331
WBS 2	I am able to use a learning management system to support teaching.	3.16	1.336

WBS 3	I am able to use blogging for personal use.	2.98	1.348
	Overall Computer Self-Efficacy	**3.10**	**1.219**

The overall computer self-efficacy mean score of 3.10 was reported by the participants indicating that generally teachers neither disagree nor agree that they are computer self-efficacious. More specifically, again, teachers neither disagree nor agree (M=3.12, SD= 1.33) that they are computer self-efficacious in web based skills and they disagree (M=2.26, SD=1.18) that they are computer self-efficacious in media related skills. However, teachers agree (M= 3.77, SD=1.13) that they are self-efficacious in basic computer skills.

Teachers' gender, age and computer experience and their computer self-efficacy

Effect of gender on teachers' Computer Self-Efficacy.

Table 3: Reported Level of Computer Self-Efficacy by Gender

Subscale	Gender	N	Mean	SD	df	t	p
Basic Computer Skills	Male	229	3.48	1.336			
	Female	178	3.61	1.269	405	-1.085	.279
Media Related Skills	Male	229	2.51	1.301			
	Female	178	2.53	1.311	405	-.280	.780
Web Based Skills	Male	229	2.85	1.357			
	Female	178	2.59	1.242	405	2.449	.015*
Overall Computer self-efficacy	Male	229	2.95	1.331			
	Female	178	2.91	1.274	405	.191	.849

*significant at 0.05

The *t* independent test analyses revealed no statistically significant difference between overall computer self-efficacy of male and female teachers. Furthermore, in terms of basic computer skills and media related skills subscales, *t* test analyses revealed no significant differences between male and female teachers. However, the independent *t*-test revealed statistically significant difference between web based skills of male and female teachers in relation to their computer self-efficacy (t (405) = 2.449, p = .015) indicating that male teachers possess a higher computer self-efficacy (M=2.85, SD=1.357) with respect to web based skills than their female counterparts (M=2.59, SD=1.242). Table 3 highlights this.

Effect of age on teachers' computer self-efficacy

The results of *t*-test analyses revealed no statistically significant difference between the overall computer self-efficacy of teachers of 20-30 years and those of 31 years and above. In regard to basic computer skills and web based subscales, *t* test analyses found no significant differences respectively in terms of age.

Table 4: statistical scores of teachers' age and their computer self-efficacy

Subscale	Age	N	Mean	SD	df	t	p
Basic Computer Skills	20-30 years	231	3.58	1.317			
	31 yrs and above	176	3.47	1.291	405	.984	.326
Media Related Skills	20 -30 years	231	2.58	1.295			
	31 yrs and above	176	2.43	1.306	405	1.975	.047*
Web Based Skills	20 -30 years	231	2.74	1.283			
	31 yrs and above	176	2.73	1.350	405	1.472	.055
Overall Computer self-efficacy	20 -30 years	231	2.97	1.298			
	31 yrs and above	176	2.88	1.316	405	1.376	.170

*significant at 0.05

In contrast, *t* test analyses depicted statistically significant difference between media related skills of teachers who were aged between 20-30 and those with 31 years and above (t (405) =1.975, p=.047), indicating that teachers aged 20-30 years possess higher media related skills (M=2.58, SD=1.295) regarding computer self-efficacy than those who were aged between 31 years and above (M=2.43, SD=1.306). Table 4 highlights this.

Effect of teachers' Computer Experience on their Computer Self-Efficacy

Table 5 highlights the statistical scores on teachers' computer experience and their computer self-efficacy.

Table 5: Scores on teachers' computer experience and their computer self-efficacy

Subscale	Computer Experience	N	Mean	SD	df	t	p
Basic Computer Skills	Low	246	4.03	1.497			
	High	161	4.18	1.506	405	-1.345	.179
Media Related Skills	Low	246	2.66	1.463			
	High	161	2.87	1.399	405	-2.280	.014*
Web Based Skills	Low	246	3.20	1.484			
	High	161	3.43	1.413	405	-1.993	.047*
Overall Computer self-efficacy	Low	246	3.30	1.481			
	High	161	3.49	1.439	405	-2.952	.004*

*significant at 0.05

The independent sample *t*-test scores showed statistically significant difference between overall computer self-efficacy of teachers with high computer experience and those with low computer experience (t (405) = -2.952, p=.004). This suggests that teachers with high computer experience possess higher overall computer self-efficacy (M=3.49, SD=1.439) than those with low computer experience (M=3.30, SD=1.481). In relative terms, it was found that there was statistically significant difference between media related skills of teachers with high computer experience and those with low computer experience (t (405)=-2.280, p=.014), indicating that teachers with high computer experience have higher media related skills (M=2.87, SD=1.399) than those with low computer experience (M=2.66, SD=1.463). Similarly, there was statistically significant difference between web-based skills of teachers with high computer experience and those with low computer experience (t (405) = -1.993, p=.047). This means that teachers with high computer experience possess higher web-based skills (M=3.43, SD=1.413) than their counterparts with low computer experience (M=3.20, SD=1.484). However, there was no statistically significant difference between basic computer skills of teachers with high computer experience and those with low computer experience.

Interaction effect of teachers' demographic variables on their 'computer self-efficacy
The effect of gender and computer experience on teachers' computer self-efficacy.

Table 6 shows the mean scores of male and female teachers with low and high computer experiences with respect to their computer self-efficacy in general. Univariate analyses of variance revealed that there was an interaction effect between male and female teachers with low computer experience and male and female teachers with high computer experience on their computer self-efficacy [F(2, 403)=.6999, p=.008] (Figure 1) "eta square" = .017.

Table 6: Mean scores of teachers' computer experience, gender and their computer self-efficacy

Computer experience	Gender	Mean	SD	N
	Male	39.95	7.21	122
Low (1-5 years)	Female	41.50	6.85	104
	Total	40.66	7.07	226
	Male	42.19	6.44	107
High (6 years and above)	Female	40.01	7.50	74
	Total	41.30	6.96	181
	Male	40.99	6.93	229
Total	Female	40.88	7.14	178
	Total	40.95	7.02	407

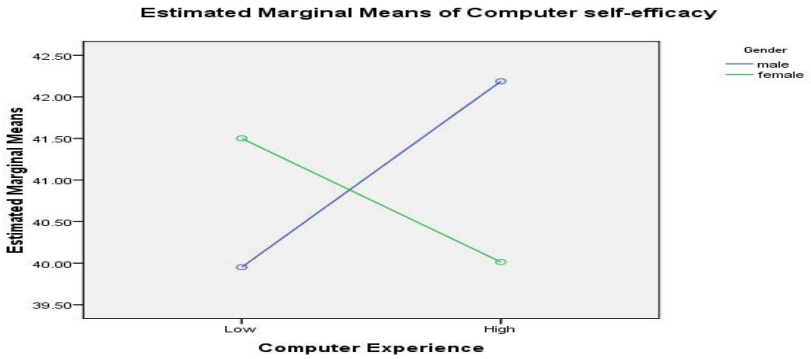

Figure 1: Interaction effects of computer experience and gender

The effect of teachers' computer experience and age on their computer self-efficacy

Univariate analyses revealed no interaction effect on teachers' computer experience and age on their computer self-efficacy. Table 7 and figure 2 highlight this.

Table 7: Scores on teachers' computer experience, age and their computer self-efficacy

Age	Computer Experience	Mean	SD	N
	Low	35.61	8.52	135
20-35 years	High	35.28	8.83	96
	Total	35.47	8.64	231
	Low	34.34	8.69	101
36 years and above	High	34.16	9.47	75
	Total	34.26	9.00	176
	Low	35.06	8.60	236
Total	High	34.79	9.11	171
	Total	34.95	8.81	407

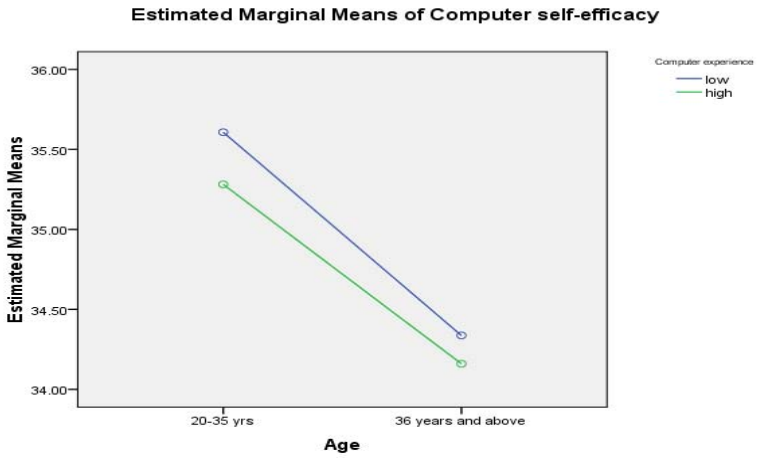

Figure 2: Interaction effects of age and computer experience

Effect of teachers' age and gender on their computer self-efficacy

Univariate analysis revealed no no statistical significant main effects for age and gender on teachers' computer self-efficacy [F (1,402) = .130, p= .719] suggesting no intraction effect. Table 8 and figure 3 highlight this.

Table 8: scores on teachers' age, gender and their computer self-efficacy

Age	Gender	Mean	SD	N
	Male	40.80	6.79	152
20-35 years (young)	Female	41.07	7.21	124
	Total	40.92	6.97	276
	Male	41.39	7.24	77

36 years and above (old)	Female	40.57	7.05	53
	Total	41.05	7.15	130
	Male	40.50	6.93	229
Total	Female	40.92	7.14	177
	Total	40.96	7.02	406

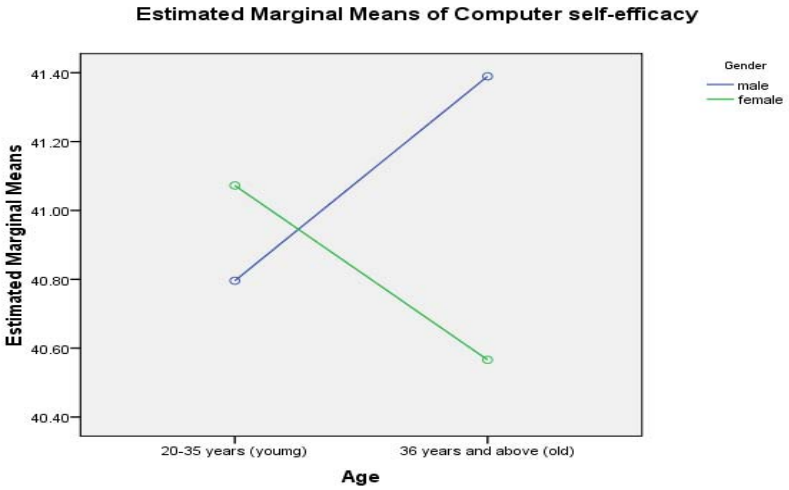

Figure 3: Interaction effects of age and gender

DISCUSSION

This study was conducted to examine the levels of computer self-efficacy among teachers in SHSs. It also aimed at ascertaining the effects of teachers' gender, age, and computer experience on their computer self-efficacy. Moreover, the study was designed to investigate the interaction effects of teachers' gender, age and computer experience on their computer self-efficacy. The result indicated that generally SHS teachers (in Ghana) neither agree nor disagree that they are computer self-efficacious. This implies that SHS teachers in Ghana are not very certain as to whether they have confidence and capabilities in using word processor to create, edit and format documents for teaching and learning purposes; to use the Internet search for information and also use presentation software such as PowerPoint for classroom delivery. This finding, to some extent, is consistent with the findings of previous studies in other countries such as that of Kong et al. (2014), Hasan (2003) and Ozturk et al. 2011) that generally teachers have moderate computer self-efficacy.

However, specifically, according to the findings of the study SHS teachers in Ghana agree that they have computer self-efficacy in basic computer skills (BCS); they are not very certain about their self-efficacy in web based skills (WBS) but they agree that they are not self-efficacious in media related skills (MRS). The finding that SHS teachers in Ghana are self-efficacious in BCS (e.g. word processing, the Internet) is similar to research findings by Sarfo et al. (2016) that SHS teachers have high competencies in word processing applications and internet; the finding is also consistent with Teo and Koh (2010) and Jegede (2007). This finding is not surprising at all since it is expected that teachers would need these basic computer skills (e.g., word processing and e-mail) in their everyday (teaching) work and also for communication purposes. To partially support this, the findings of Sarfo et al. (2016) indicate that SHS teachers have competencies in using the Internet but interestingly they often use internet, specifically e-mail for social communication rather than teaching and learning. Another reason for teachers being self-efficacious BCS is that almost all the teachers have been having training workshops on basic computer skills to facilitate teaching and learning. Teachers (in Ghana) accepting that they are not computer self-efficacious about media related skills as reported in the present study is congruent with research finding by Sarfo et al. (2016) that SHS teachers have low competence level in multimedia software and database application software. This finding could be explained from the point of view that media related software for graphic and video editing, animations and websites editing are more highly complex and expensive specialised tools which are less emphasised in the training of teachers in Ghana. With this regard teachers are more likely to be less efficacious about this aspect of computer self-efficacy.

Generally, the finding of the study also revealed that gender of SHS teachers has no effect on their computer self-efficacy. This suggests that both male and female SHS teachers have similar computer self-efficacy. In addition, there were no significant differences in two categories (BCS and MRS) of computer self-efficacy between male and female SHS teachers. This also indicates that both male and female teachers have similar

computer self-efficacy in relation to basic computer skills and media related skills. These findings support the previous finding of Jegede (2007) that there is no significant difference in teachers' computer self-efficacy with regard to gender. However, the findings are inconsistent with that of Topkaya (2010) and Ozturk et al. (2011). One possible reason for this similarity in computer self-efficacy among males and female teachers is that, female teachers possibly might have realised that they should develop confidence and capabilities in the usage of computer as their male counterparts in order to cope with the new requirements of their profession and also to cope with the emerging technological and knowledge able society. Another reason is that in Ghana, there are several governmental and non-governmental programmes on different platforms to empower females to increase their confidence and self-esteem in science, technology (computer) engineering, and mathematics (STEM). On the contrary, the result of the present study indicates that male teachers have higher computer self-efficacy in WBS than female teachers. This implies that there is gender difference in respect to teachers' computer self-efficacy of WBS in favour of males. This result confirms that of Kong, et al. (2014), Topkaya (2010) and Ozturk et al (2011). But it is important to note that Kong et al. (2011) and other related studies which show gender difference might/do not specify or concentrate (on) respondents' computer self-efficacy in terms of the use of specific computer application software (e.g., BCS, WBS MRS) or tasks.

The study again revealed that there is no difference in *overall* computer self-efficacy between teachers of 20-30 years and those of 31 years and above. Again, the findings of the study show that the age of the teachers does not influence their computer self-efficacy in both BCS and WBS**.** These results suggest that the two categories of teachers in terms of age have similar computer self-efficacy in the use of general computer skills, BCS and WBC. These current findings agree with the findings of Adebowale et al. (2009) who reported that age has nothing to do with computer self-efficacy. But the findings are at variance with previous studies by Elbitar (2015) that younger teachers have high computer self-efficacy than older teachers. In addition, the results of the present study partially do not support the conception of "Digital Native" and "Digital Immigrant" by Prensky (2001). It might be that the old teachers have improved their confidence and capabilities in computer usage through persuasion (Bandura, 1994) and training in order to cope with the new challenges of their profession and 21st century teaching (education) and have therefore become computer efficacious as the younger teachers. In spite of this, specifically, according the findings of the study the younger teachers are more efficacious than the old teachers in terms of the usage of MRS. This particular result supports the findings of Elbitar (2015) and others that younger teachers are more capable and confident in the use of computer in teaching and learning. This finding is in line with the conception of Prensky (2001) on Digital natives and digital immigrants. Based on the present findings (and others), it is argued that the older teachers have the confidence and capabilities in the use of certain computer application software as the younger teachers do but they are not capable of using other complex computer application software (MRS) effectively in teaching and learning as the younger teachers.

In addition, the findings of the present study indicate that the respondents with more computer experience are more efficacious in the general computer skills as well as specific computer skills such as MRS and WBS. Similar findings were established by Elbitar (2015), Hasan (2013) and His-Chi et al. (2010). However, the findings disagree with a previous study by Karsten and Roth (1998) who indicated that computer experience had no significant influence on teachers' computer self-efficacy beliefs. The results of the present study and others (e.g., Elbitar, 2015) that teachers' experience has influence on their computer self-efficacy support the Bandura (1994, 1997) that mastery experience is one of the important sources of self-efficacy. The teachers' more experience (working with computer for 6 years and above) with computer, in this jurisdiction, is considered as desirable and vital in their profession (teaching and learning).

According to the findings of the study, teachers' computer experience has no impact on their computer self-efficacy related to BCS. This finding is consistent with the research claims by Karsten and Roth (1998) that long exposure to computer has no significant influence on computer self-efficacy and usage. One of the reasons that might explain this finding is that many of the training workshops organised for teachers are focused on the acquisition of basic computer skills; and irrespective of their computer experience they need these basic computer skills to cope with their daily teaching work.

The outcome of the study furthermore shows that there is an interaction effect between male and female teachers with low computer experience and male and female teachers with high computer experience on their computer self-efficacy. This implies that SHS teachers' gender and computer experience work together in eliciting teachers' computer self-efficacy. This finding seems new in the global literature on integration of computer into teaching and learning. To some extent, it reveals why there are inconsistent findings of 1) the impact of teachers' computer experience on their computer self-efficacy and 2) the impact of teachers' gender on their computer self-efficacy.

CONCLUSION

The findings that SHS teachers in Ghana generally are not certain about their computer self-efficacy and specifically agree that they are self-efficacious in basic computer skills but not certain about their self-efficacy in web based skills and also not self-efficacious in media related skills are very new, prominent and significant for educational researchers, educational (technology) practitioners or researchers and educational policy-makers (in Ghana). The findings suggest that the teachers are unlikely to use and integrate computers in their teaching and learning in classrooms effectively as expected. This indicates that they need more training and support to develop (full) confidence in computer usage to facilitate teaching and learning. Since teachers agree that they don't have confidence in the use of specific computer software (e.g., MRS), special training or intervention should be organised by policy makers or Ghana Education Service (GES) to address this deficiency.

Furthermore, according to the findings of the study, there are similarities and dissimilarities of confidence and capabilities among 1) male and female teachers, 2) old and younger teachers, and 3) teachers with more computer experience and those with low computer experience in the use of different computer application software. Some of these teacher related factors furthermore work together to produce teachers' confidence and capabilities in the use of the computer**,** one factor cannot be considered without the other. For instance, according to the findings, whether a teacher's computer experience would have impact on his/her confidence and capabilities in using computer in teaching and learning depends on the gender of the teacher. This implies that different and specific interventions and training or instruction should be organised for different categories of teachers to improve their confidence and skills in the use of different computer software effectively in teaching and learning. The findings of the present study provide explanation for inconsistent research findings of the effect of (SHS) teachers' age, gender, and computer experience on their computer self-efficacy in the literature on the integration of computer technology into education in both developed and developing countries. In addition, the findings suggest the directions for organising interventions and training to improve teachers' computer self-efficacy to enhance successful integration of computer into teaching and learning. It is argued that the findings of the present study, to some extent, are significant and new contribution to the global literature on integration of computers into teaching and learning. Further research is suggested to be conducted to support or challenge the findings of the study. The suggested research studies should be expanded to include the mediating and moderating roles of the teacher related factors that influence teachers' computer self-efficacy.

REFERENCES

Adams, N. B. (2002). Educational computing concerns of postsecondary faculty. *Journal of Research on Technology in Education, 34*(3), 285-303.

Adebowale, O. F., Adediwura, A. A., & Bada, T. A. (2009). Correlates of computer attitude among secondary school students in Lagos State, Nigeria. *International Journal of Computing and ICT Research, 3*, 20-30.

Aremu, A. & Fasan, O. (2012). Age, gender, teaching experience, academic qualification, access to computer and computer experience as correlates of computer self-efficacy of Nigerian secondary school teachers. *International Journal of Educational Leadership, 4*(4), 147-154.

Awofala, A. O. A., Fatade, A. O., & Udeani, U. N. (2015). Nigerian pre-service science, technology and mathematics teachers' computer self-efficacy: An exploration based on gender, age and discipline of study. *International Journal of Education in Mathematics, Science and Technology, 3*(2), 101-119.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, New York: Prentice-Hall.

Bandura, A. (1994). Self-efficacy. In V. S. Ramachandran, (Ed.), *Encyclopaedia of human behaviour* (pp. 71 - 81), New York: Academic Press

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman

Bingimlas, K. A. (2009). Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature. *Eurasia Journal of Mathematics, Science and Technology, 5*(3), 235-245.

Bitner, N., & Bitner, J. (2002). Integrating technology with the classroom: Eight keys to success. *Journal of Technology and Teacher Education, 10*(1), 95-100.

Bouffard-Bouchard, T. (1990). Influence of self-efficacy on performance in a cognitive task. *The Journal of Social Psychology, 130*, 353-363.

Bozionelos, N. (2001). Computer anxiety: Relationship with computer experience and prevalence. *Computers in Human Behaviour, 17*(2), 213 -224.

Buabeng-Andoh, C. (2012). An exploration of teachers' skills, perceptions and practices of ICT in teaching and learning in the Ghanaian second-cycle schools, *Contemporary Educational Technology, 3*(1), 36 -49.

Cassidy, S., & Eachus, P. (2002). Developing the computer user self-efficacy scale: Investigating the relationship between computer self-efficacy, gender and experience with computers. *Journal of Educational Computing Research, 26*(2), 133-153.

Cohen, L., Manion, L., & Morrison, K. (2000). *Research methods in education* (5th ed). London: Routledge Falmer.

Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly, 19*(2), 189-211.

Czaja, S.J., Charness, N., Fisk, A.D., Hertzog, C., Nair, S.N., Rogers,W.A., & Sharit, J. (2006). Factors predicting the use of technology: Findings from the Center for Research and Education on Aging and Technology Enhancement (CREATE). *Psychology and Aging, 21*, 333–352

Elbitar, H. M. M. (2015). Egyptian industrial education teachers' perceived computer self efficacy. *International Journal of Vocational and Technical Education*, 7(8), 80-88.

Ertmer, P.A. (2006). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Education Technology Research and Development, 53*(4), 25-39.

Gulbahar, Y. (2007). Technology planning: A roadmap to successful technology integration in schools. *Computers & Education, 49*(4), 943 -956

Hasan, B. (2003). The influence of specific computer experiences on computer self-efficacy beliefs. *Computers in Human Behaviour, 19*, 443-450.

His-Chi, H., Yuh-Rong, L., & Ya-Ling, T. (2010). Gender differences in computer experience and computer self-efficacy among high school teachers. *The Second Asian Conference on Education*, Osaka, Japan, pp 1380-1391.

Inan, F.A., & Lowther, D. L. (2009). Factors affecting technology integration in K-12 classrooms: A path model. *Education Technology Research Development, 58*, 137 -154.

Jegede, P. O. (2007). Factors in computer self-efficacy among Nigerian college of education teachers. *Journal of Psychology in Africa, 17*(1), 39-44. Retrieved January 7, 2015 from http://dx.doi.org/10.1080/14330237.2007.10820142

Karsten, R., & Roth, R. (1998). Computer self-efficacy: A practical indicator of student computer competency in introductory IT courses. *Informing Science, 1*(3), 61-68.

Khorrami-Arani, O. (2001). Researching computer self-efficacy. *International Education Journal, 2*(4), 17-25.

Kinzie, M. B., Delcourt, M. A. B., & Powers, S. M. (1994). Computer technologies: Attitudes and self-efficacy across undergraduate disciplines. *Research in Higher Education, 35*(6), 745-768.

Kong, K. S., Chai, M. L., Tan, K. W., Hasbee, U., & Ting, L. N. (2014). ESL teachers' computer self-efficacy, attitudes toward computer and classroom computer use. *Pertanika Journal of Social Sciences and Humanities, 22*(2), 369-385.

Marakas, G. M., Yi, M. M., & Johnson, R. D. (1998). The multilevel and multifaceted character of computer self-efficacy: Toward clarification of the construct and an integrative framework for research. *Information Systems Research, 9*(2), 126-162.

Mereku, D. K., Yidana, I, Hordzi, W., Tete-Mensah, I., Tete-Mensah, W., & Williams, J. B. (2009). *Pan African research agenda on the pedagogical integration of ICTs: Ghana report*. Retrieved fromhttp://www.ernwaca.org/panaf/pdf/phase-1/Ghana-PanAf_Report.pdf on June 17, 2015.

Mills, S. C., & Tincher, R. C. (2003). Be the technology: A developmental model for evaluating technology integration. *Journal of Research on Technology in Education, 35*(3), 382 -401.

Ozcelik, H., & Kurt, A. A. (2007). Primary school teachers' computer self-efficacies: Sample of Balikesir. *Elementary Education Online, 6*(3), 441-451. Retrieved November 18, 2014 from http://ilkogretim-online.org.tr/vol6say3/v6s3m34.pdf

Ozturk, N., Bozkurt ,E., Kartal, T., Demir, R., & Ekici, G. (2011). Evaluation of prospective science teachers' computer self-efficacy. *Western Anatonia Journal of Educational Science, 1*, 181-187.

Pajares, F. (2002). *Overview of social cognitive theory and of self-efficacy*. Retrieved October 16, 2015 from http://www.des.emoy.edu/mfpleff.html

Papert, S. (1980). *Mindstorms: Children, computers, and powerful ideas*. Basic Books Inc.

Prensky, M. (2001). Digital native, digital immigrants. *On the Horizon, 9*(5), 1-6. Retrieved February 11, 2016 from http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives%20Digital%20Immigrants%20-%20Part1.pdf

Rajashekhar, S. (2015). *How values to interpret cumulative/dimension mean of Likert five point scale*. Retrieved December 15, 2016 from https://groups.google.com >eqiykGpedRL

Republic of Ghana (2002). *Meeting the challenges of education in the 21st century*: *Report of the president's committee on review of education reforms in Ghana.* Accra: Adwinsa Publications.

Russell, M., Debell, D., Dwyer, L. O., & Connor, K. O. (2003). Examining teacher technology use: Implication for pre-service and in-service teacher preparation. *Journal of Teacher Education, 54*(4), 297-310.

Salomon, G. (2002). Technology and pedagogy: Why don't we see the promised revolution? *Educational Technology*, 42(2), 71-75.

Sarfo, F. K., & Elen, J. (2008). The moderating effect of instructional conceptions on the effect of powerful learning environment: *Instructional Science, 36*, 137 -153.

Sarfo, F. K., & Ansong-Gyimah, K. (2011). Ghanaian senior high school students' access to and experiences in the use of information and communication technology. In A. Mendez-Vilas (Ed.). *Education in a technological world: Communicating current and emerging research and technological efforts*, Formatex Research Centre, Spain, pp 216- 223.

Sarfo, F. K., Amankwah, S., Oti-Agyen P., & Yidana, I (2016). Information and communication technology access and use and competency level among second-cycle school teachers in Ghana. *Journal of Medial and Communication Studies*. *8*(5), 43 -51. Doi: 10.5897/JMCS2016.0495

Straub, D., Boudreau, M., & Gefen, D. (2004). Validation guidelines for IS positivist research. *Communications of the Association for Information Systems, 13*, 380 – 427.

Teo, T., & Koh, J. H. L. (2010). Assessing the dimensionality of computer self-efficacy among pre-service teachers in Singapore: A structural equation modelling approach. *International Journal of Education and Development using Information and Communication Technology, 6*(3), 7-18.

Topkaya, E. Z. (2010). Pre-service English language teachers' perceptions of computer self-efficacy and general self-efficacy. *The Turkish Online Journal of Educational Technology, 9*(1), 143-156.

United Nations (2005). *World summit on the information society: Tunis commitmen*t. New York: United Nations.

Wadmany, R. (2011). Factors explaining teachers' ICT use and productivity in technology-enriched classrooms. In A. Mendez-Vilas (Ed.). *Education in a technological world: Communicating current and emerging research and technological efforts*, Formatex Research Centre, Spain, pp 211- 215.

World Bank (2007). *Country brief*: Ghana

Zimmerman (2000). Self-efficacy: An essential motive to learn. *Contemporary Educational Psychology, 25*, 82-91. Retrieved February 20, 2016 from http://www.idealibrary.com

In addition, as indicated by Buabeng-Andoh (2012) Many governments in both developed and developing countries have inited serious investments in computer technology to improve teachhing and learning. For instance, in 2008-2009 the Government in United Kingdom spends (pounds)2.5 billion on ICT in educationa; in United State of America, the Nation spends $6 billion and $4.7 billion on K-12 schools and higher education institutions respectively in 2009 (Nut, 2010 cited in Buabeng-Andoh 2012, pp. 136). In 2008, Morocco spends 12.5% of ither GDP on ICT activities (including education); Senegal spends 10.5% of her GPD on ICT activities including education; and Nigeria spends 3.1% of her GPD on ICT activities including education (Vota, 2010). In Ghana, the integration of ICT into education began to receive government attention in the past years.